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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/606,633	06/25/2003	John M. Heck	42P16641	4995

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Anthony H. Azure
BLAKELY, SOKOLOFF, TAYLOR & ZAFMAN LLP
Seventh Floor
12400 Wilshire Boulevard
Los Angeles, CA 90025-1026

EXAMINER

NGUYEN, HOA CAO

ART UNIT	PAPER NUMBER
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2841

DATE MAILED: 03/30/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/606,633

Applicant(s)

HECK ET AL.

Examiner

Hoa C. Nguyen

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 27 February 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-5, 7-15, 17 and 18 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-5, 7-15, 17-18 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

1. The amendment filed on 1/24/06 has been entered. Applicants cancelled claims 6 and 16. Claims 1-5, 7-15, and 17-18 are considered in this Office action.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

4. Claims 1-5, 7-15, and 17-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hinz et al. (US 6559530) in view of common knowledge and Poilasne et al. (6900773).

Regarding claim 1, as shown in figure 3b, Hinz et al. discloses an apparatus comprising:

(a) A Micro-electromechanical system (MEMS) module including at least one MEMS device 50 and a cap 58 (lid) covering the at least one MEMS device, see column 3, lines 43 and 46;

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(b) at least one contact 70 (solder balls) mounted to a bottom of the MEMS module (considering the bottom is arbitrary defined as the cap side), see column 4, line 10;

(c) at least one via 59 to pass vertically through the cap to electrically couple the at least one MEMS device to the contact, see column 3, lines 47-48 and column 4, lines 7-9.

However, Hinz et al. failed to disclose a trace ring couple to the MEMS device, wherein one of an input terminal or an output terminal for MEMS device coupled to the trace ring.

It is noticed that a MEMS device is known to imply a wide variety of electronic components such as accelerometers, DC Relay, sensors (MEMS sensor), RF switches (MEMS switches), oscillators, switched banks of filters just to name a few. In the case of MEMS switches, the device is conventionally known to have input/output and voltage actuation terminals, and a MEMS module is known to have circuit traces and a build-in antenna (option) that surround the MEMS device. The circuit traces and/or a build-in antenna are technically considered as a trace ring (if partially or in whole surrounding the device) and at least an input/output terminal must be coupled to the trace ring for the functioning of the device.

Poilasne et al., as shown in figures 1-4C, disclose an apparatus containing a MEMS device 41 (a control element, figure 4A, column 7, lines 21-22 and 29) and a trace ring 96 (an embedded antenna, column 7, line 21), wherein at least one of an input terminal or an output terminal (no number, also see figures 3A-4C) of the MEMS

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device coupled to the trace ring (also see column 3, lines 6-12). Poilasne et al. further teach that the antenna is provided with frequency switching capability that may be linked to a particular device for its application in wireless communications (frequency switching solution – A MEMS switch, see column 4, lines 42-54).

It would have been obvious to one having ordinary skill in the art at the time of invention was made to apply the teachings from Poilasne et al. about the embedded antenna on the MEMS module of Hinzl et al. in order to form a compact wireless communication device, since an embedded antenna would minimize the size of a communication system.

Regarding claim 2, Hinzl et al. discloses the at least one MEMS device 50 comprises a MEMS RF switch array inherently including at least one switch, see column 1, lines 14-16.

Regarding claim 3, a MEMS module is conventionally known to have at least an input, output, and actuation terminal, therefore Hinzl et al. anticipate the claim (see claim 1 above).

Regarding claim 4, as shown in figure 3b and claim 1 above, Hinzl et al. disclose a plurality of vias 59/54 (column 3, line 47 and column 4, line 9) for providing interconnections for the MEMS module, therefore it is inherently that the input, output, and actuation terminal each electrically connected to a first, a second, and a third via of the plurality of vias.

Regarding claim 5, as shown in figure 3b, Hinzl et al. disclose a plurality of contacts 70 (solder balls, column 4, line 10) electrically connecting to a plurality of vias

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59 inherently including a first, second, and third contact of the plurality of contacts 70 couples to the first via, second via, and third via respectively.

Regarding claim 7, Hinz et al. in view of Poilasne et al. disclose the trace ring as shown in claim 1 above, which surrounds at least a portion of the MEMS device (Poilasne et al., figures 4A-C) and inherently allow a signal to transit the MEMS module using a second via of the at least one via without cross the trace ring. The without crossing is because Hinz et al. use vertical vias 59 formed through the cap for the interconnections of the MEMS module and the trace ring is formed surrounding the MEMS device area providing an area around the MEMS device for wiring formation (see Poilasne et al., figure 4A).

Regarding claim 8, Hinz et al. discloses a seal ring (no number) to couple the cap 58 to a section 60 (seal area) of the MEMS module, wherein the sealed area of the MEMS module includes the at least one MEMS device 50, see column 3, lines 47-52 and column 4, lines 14-19.

Regarding claim 9, Hinz et al. discloses a printed circuit board 68 (beside a printed circuit board 56, substrate 68 is technically a PCB containing one or more non-MEMS devices 66) coupled to the contacts 70, see column 4, lines 1-7.

Regarding claim 10, Hinz et al. and further in view of Poilasne et al. disclose every limitation as shown in claims 1 and 2 above.

Regarding claim 11, Hinz et al. disclose every limitation as shown in claim 8 above.

Regarding claims 12 and 13, Hinz et al. disclose every limitation as shown in claim 10 above except that the cap section comprises silicon or ceramic. However, Hinz et al. does disclose the thermal expansion coefficient, which should be about equal between the cap and the substrate 52 where the cap is bonded, see column 3, lines 54-56.

It would have been obvious to one having ordinary skill in the art at the time of invention was made to have the cap section comprising either ceramic or silicon or any other material in order to match the thermal coefficient expansion of the substrate 52 where the cap is bonded to.

Regarding claim 14, Hinz et al. and further in view of Poilasne et al. disclose every limitation as shown in claims 10 and 4 above.

Regarding claim 15, Hinz et al. discloses a plurality of MEMS switches array 50 and at least two MEMS devices are shown in figure 3b. It is inherently that each RF switch array needs a separate input and a separate actuation terminal for controlling each individual RF switch array and it is logically that only one output terminal is needed for transmitting a RF signal to the antenna (one frequency band at a time for example). Thus, a second RF switch array must be electrically coupled to a second input and actuation terminal and its output terminal is shared with other RF switch arrays. Thus, Hinz et al. and further in view of Poilasne et al. anticipate the claim.

Regarding claim 17, Hinz et al. and further in view of Poilasne et al. discloses every limitation as shown in claims 1 and 7 above.

Regarding claim 18, Hinz et al. disclose every limitation as shown in claim 9 above.

Response to Arguments

5. Applicants' arguments about the claim rejections, filed on 26 October 2005, have been fully considered but they are moot in view of the new ground(s) of rejection.

Citation of Relevant Art

6. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure:

Hsu (US 20050024165) discloses an apparatus comprising a micromechanical resonator.

Cheever et al. (US 20030047799) disclose a wafer level interconnection.

Cohn et al. (US 6853067) disclose a microelectromechanical systems using thermocompression bonding.

Huff et al. (US 20040262645) disclose a radio frequency microelectromechanical systems (MEMS) devices on low-temperature co-fired ceramic (LTCC) substrates.

Ma et al. (US 20040012464) disclose a microelectromechanical apparatus and methods for surface acoustic wave switching.

Tilmans et al. (US 6876056) disclose a method and system for fabrication of integrated tunable/switchable passive microwave and millimeter wave modules.

Hembree et al. (US 6426484) disclose a circuit and method for heating an adhesive to package or rework a semiconductor die.

Huang et al. (US 6384353) disclose a micro-electromechanical system device.

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Curtis et al. (US 6914323) disclose a methods and apparatus for attaching getters to MEMS device housings.

Wong et al. (US 6713314) disclose a hermetically packaging a microelectromechanical switch and a film bulk acoustic resonator.

Anderson et al. (US 6891239) disclose an integrated sensor and electronics package.


Conclusion

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Hoa C. Nguyen whose telephone number is 571-272-8293. The examiner can normally be reached on M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kammie Cuneo can be reached on 571-272-1957. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Hoa C. Nguyen
6/27/06


KAMMIE CUNEO
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800